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FILE 'USPAT' ENTERED AT 11:20:58 ON 11 SEP 1998

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* U. S. P A T E N T T E X T F I L E *
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=> s 251/313/ccls and refrigerator

147 251/313/CCLS
18729 REFRIGERATOR
L1 0 251/313/CCLS AND REFRIGERATOR

=> s 251/313/ccls and damper

147 251/313/CCLS
22047 DAMPER
L2 1 251/313/CCLS AND DAMPER

=> d cit 12

1. 4,205,783, Jun. 3, 1980, Independent biasing means for automatic flue damper; Robert J. Dietsche, et al., 236/1G; 126/285B; 251/129.11, 313; 431/20 [IMAGE AVAILABLE]

=> s 251/303/ccls and refrigerator

476 251/303/CCLS
18729 REFRIGERATOR
L3 1 251/303/CCLS AND REFRIGERATOR

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1. 5,361,596, Nov. 8, 1994, Refrigerator system, a control device therefor and methods of making the same; David D. Martin, 62/187; 49/397; 251/303 [IMAGE AVAILABLE]

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476 251/303/CCLS
22047 DAMPER
L4 9 251/303/CCLS AND DAMPER

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1. 5,303,897, Apr. 19, 1994, Arrangement in valve dampers; Paul Tengesdal, et al., 251/85, 298, 303, 308; 454/333 [IMAGE AVAILABLE]

2. 4,557,183, Dec. 10, 1985, Incrementally adjustable vent; Stanley Kolt, 454/358; 251/297, 303 [IMAGE AVAILABLE]

3. RE 31,562, Apr. 24, 1984, Heating vent for electric clothes dryer; James D. Bede, 34/86, 235; 137/875; 165/901; 251/303 [IMAGE AVAILABLE]

4. 4,156,973, Jun. 5, 1979, Heating vent for electric clothes dryer; James D. Bede, 34/86, 235; 137/875; 165/901; 251/303 [IMAGE AVAILABLE]

5. 4,019,714, Apr. 26, 1977, Valve construction; Marlin Kemmerer, 251/129.2, 303; 454/333 [IMAGE AVAILABLE]

6. 3,951,051, Apr. 20, 1976, Dampers; Hal Dry, 454/357; 49/376;

126/285B; 137/601; 251/303; 454/363 [IMAGE AVAILABLE]

7. 3,926,216, Dec. 16, 1975, Arrangement of check valves; Carl-Edvard Jan Rulcker, 137/527.8; 251/303 [IMAGE AVAILABLE]

8. 3,899,156, Aug. 12, 1975, Single blade fire **damper**; Francis J. McCabe, 251/303; 137/75, 457; 292/121; 454/369 [IMAGE AVAILABLE]

9. 3,614,486, Oct. 19, 1971, LEVER MOTION MULTIPLIER DRIVEN BY ELECTROEXPANSIVE MATERIAL; Parker C. Smiley, 310/323; 101/93.01, 93.2, 212; 251/129.06, 303; 310/26, 317; 400/167 [IMAGE AVAILABLE]

=> s 62/408/ccls and refrigerator

646 62/408/CCLS
18729 REFRIGERATOR
L5 67 62/408/CCLS AND REFRIGERATOR

=> s 62/408/ccls and damper

646 62/408/CCLS
22047 DAMPER
L6 51 62/408/CCLS AND DAMPER

=> s damper (p) motor (p) refrigerator

22047 DAMPER
407949 MOTOR
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=> s damper (p) motor (p) refrigerator and 62/408/ccls

22047 DAMPER
407949 MOTOR
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50 DAMPER (P) MOTOR (P) REFRIGERATOR
646 62/408/CCLS
L7 6 DAMPER (P) MOTOR (P) REFRIGERATOR AND 62/408/CCLS

=> d kwic 17 1-6

US PAT NO: 5,778,694 [IMAGE AVAILABLE]
US-CL-CURRENT: 62/187, 408; 236/51

L7: 1 of 6

ABSTRACT:

A **refrigerator** includes a plurality of cold air inlet openings formed in a rear wall of the refrigerating compartment for directing cold air in respective directions into the refrigerating compartment. A **motor-driven rotary damper** is provided to control which of the inlet openings receives cold air, as well as the quantity of air introduced. . . cooling) of cooling operation the amount of air supplied corresponds to the number of air inlet openings opened by the **damper**. In a second cooling mode (concentrated cooling), the **damper** is oriented to cause the air to be introduced into the refrigerating chamber in a specific direction where cooling is needed. In a third cooling mode (automatic swinging), the **damper** is oscillated while the cold air is being supplied.

SUMMARY:

BSUM(13)

It is another object of the present invention to provide a cooling air supply control apparatus of a **refrigerator** and a control method thereof by which an eccentric **damper** is controllably driven by a stepping **motor** for being driven by a control of control means, to not only cool a particular area concentratively but also to. . .

SUMMARY:

BSUM(26)

According to the cooling air supply control apparatus of a **refrigerator** and a method thereof thus described, the cooling air discharge quantity and discharge direction are controlled by the stepping **motor** drive according to adjustment of the control of the eccentric **damper**, to thereby enable the cooling air to be discharged partially or discharged to the left and to the right in. . .

DETDESC:

DETD(39)

Meanwhile, . . . operation mode is the automatic swing operation mode (in case of Yes), the control means 42 outputs to the fan **motor** driving means 44 a control signal for driving the fan **motor** 14 to thereby drive the fan 14a, and at the same time, the stepping **motor** driving means 46 outputs a control signal for driving the stepping **motor** 26. The eccentric **damper** 27 is then driven to thereby control the **refrigerator** by way of the automatic swing operation mode which will be later described.

DETDESC:

DETD(41)

At this time, because a signal for driving the stepping **motor** 26 is being input to the stepping **motor** driving means 46 from the control means 42, the eccentric **damper** 27 is rotated according to drive of the stepping **motor** 26, to close a cooling air route of the duct 20 and to thereby terminate control operation of tire **refrigerator**.

CLAIMS:

CLMS(1)

What is claimed is:

1. A **refrigerator** comprising:
 - a refrigerating chamber having a rear wall;
 - a duct disposed at the rear wall for guiding a flow of cold. . . into respective horizontally adjacent areas of the refrigerating chamber;
 - temperature sensors for detecting temperatures in different regions of the refrigerating chamber;
 - a **motor**-driven fan for circulating cold air through the duct and the air inlet openings and into the refrigerating chamber;
 - a **damper** arranged adjacent the group of cold air inlet openings and being rotatable about an axis, the **damper** arranged eccentrically relative to the axis for controlling cold air flows through the cold air inlet openings relative to one another depending on a rotary position of the **damper**;
 - a stepping **motor** connected to the **damper** for rotating the **damper** about the axis;
 - a switch for determining a rotational position of the **damper**; and
 - a control mechanism connected to the temperature sensors and the stepping **motor** for comparing sensed temperatures with a reference

temperature and rotating the **damper** for directing cold air into the refrigerating chamber to eliminate temperature differences between the reference temperature and the sensed temperatures.

CLAIMS:

CLMS (6)

6. The **refrigerator** according to claim 1 wherein the duct extends vertically, the at least one group of horizontally spaced cold air inlet openings comprises at least two of said groups, said at least two groups spaced apart vertically; there being one said **damper** for said at least two groups; said **damper** mounted to the stepping **motor** for being rotated thereby about a vertical axis.

CLAIMS:

CLMS (7)

7. A **refrigerator**, comprising:
a refrigerating chamber having a rear wall;
a duct disposed at the rear wall for guiding a flow of cold air into respective horizontally adjacent areas of the refrigerating chamber;
temperature sensors for detecting temperatures in different regions of the refrigerating chamber;
a **motor**-driven fan for circulating cold air through the duct and the cold air inlet openings and into the refrigerating chamber;
a **damper** arranged adjacent the group of cold air inlet openings and being rotatable about an axis, said **damper** arranged eccentrically relative to the axis for adjusting cold air flows through the cold air inlet openings relative to one another depending on a rotary position of the **damper**;
a stepping **motor** connected to the **damper** for rotating the **damper** about the axis;
a switch for determining a rotational position of the **damper**; and
a control mechanism connected to the temperature sensors and the stepping **motor** for comparing sensed temperatures with a reference temperature and rotating the **damper** for establishing a quantity of cold air through the air inlet openings in accordance with the magnitude of a difference.

CLAIMS:

CLMS (9)

9. A **refrigerator** comprising:
a body forming a refrigerating chamber having a rear wall, a duct disposed in the rear wall for receiving cold air into horizontally adjacent areas of the refrigerating chamber;
a cold air generator for supplying cold air to the duct; and a **motor**-driven **damper** disposed in the duct with respective portions of the **damper** adjacent each of the groups of cold air inlet openings and positionable in different positions for directing cold air to.

US PAT NO: 5,765,388 [IMAGE AVAILABLE]
US-CL-CURRENT: 62/408, 441

L7: 2 of 6

CLAIMS:

CLMS (3)

3. The **refrigerator** as claimed in claim 1, further comprising a stepping **motor** for driving said changing **damper**.

SUMMARY:

BSUM(6)

The air discharged by the **refrigerator** fan into the freezer compartment is also supplied to the fresh food compartment. A typical **refrigerator** employs a mechanical or bellows type **damper** in order to control this air flow from the freezer compartment to the fresh food compartment. The position of the **damper** is controlled by a temperature sensor in the fresh food compartment so that the position of the **damper** controls the temperature of the fresh food compartment. However, a **damper** is slow to respond to control signals and, thus, permits unnecessarily large temperature swings within the fresh food compartment. Also, the use of a single **refrigerator** fan to supply cooled air to both the freezer and fresh food compartments requires the **refrigerator** fan speed to be relatively high, and this high fan speed increases the noise of operating the **refrigerator**. Moreover, the **refrigerator** fan is usually driven by an AC **motor** which consumes a large amount of energy.

US PAT NO: 5,678,413 [IMAGE AVAILABLE]
US-CL-CURRENT: 62/89, 186, 408

L7: 4 of 6

DETDESC:

DETD(8)

As . . . in the upper end of housing 17, for guiding cool air produced from evaporator 12 into refrigeration compartment 3. A **damper** 19 for controlling the amount of cool air provided to the refrigeration compartment by opening/closing guide path 18 and a **damper motor** 20 for driving **damper** 19 are built in the upper end of housing 17. Temperature in refrigeration compartment 3 is controlled by using these constituents in a conventional manner. A **damper** cover 21 is incorporated in front plate 24 in the embodiment and a spacer 22 is formed of an insulating material. Spacer 22 is made thick to prevent condensation on **damper** cover 21 which results from a large amount of cool air passing through guide path 18. Therefore, the upper part of housing 17 having **damper** 19 and **damper motor** 20 installed therein is also made relatively thick and wide, but its exact dimensions depend on the approximate dimensions of the **refrigerator** itself. (For a 400-500 l **refrigerator**, the thickness and width of the housing and are preferably 12 cm and 34 cm, respectively.) A cool air discharge hole 23 formed into **damper** cover 21 serves to discharge cool air from guide path 18 to auxiliary compartment 9. Thus, auxiliary compartment 9 is. . .

CLAIMS:

CLMS(13)

13. In a **refrigerator** having a body which is equipped with a freezer compartment and a refrigeration compartment, an evaporator for producing cool air. . . in the front surface, for distributing left and right or collecting said cool air from said discharge holes, a driving **motor** for rotating said cool air discharge adjustment blade, first temperature sensors installed in the center of one side wall of. . . said middle plate, and a second dispersion guiding blade for vertically connecting said middle plate and said lower plate; a **refrigerator** temperature controlling method in said control portion comprising the steps of:
determining whether a refrigerant circulating compressor is initially turned on, when power is applied;

- determining whether a door of a **refrigerator** is open, when said compressor is not initially on;
 firstly discharging cool air to be distributed by rotating a discharge **damper** with **damper** control means for controlling the amount of the cool air discharged into a **refrigerator**, when said compressor is initially on; secondly discharging cool air to be distributed by rotating said discharge **damper** with said **damper** control means for controlling the amount of the cool air discharged into said **refrigerator**, when said door is open;
 determining whether the average value of temperatures sensed by first temperature sensing means provided at a first position of said **refrigerator** is larger than the average value of temperatures sensed by second temperature sensing means provided at a second position of said **refrigerator** to face the first temperature sensing means, when said door is not open;
 discharging the cool air toward said first temperature. . .

CLAIMS:

CLMS (19)

19. In a **refrigerator** having a body having a freezer compartment and a refrigeration compartment, an evaporator for producing cool air and providing said. . . in the front surface, for distributing left and right or collection said cool air from said discharge holes, a driving **motor** for rotating said cool air discharge adjustment blade, first temperature sensors installed in the center of one side wall of. . . said middle plate, and a second dispersion guiding blade for vertically connecting said middle plate and said lower plate; a **refrigerator** temperature controlling method in said control portion comprising the steps of:

- determining whether a refrigerant circulating compressor is initially on, . . . is applied;
- determining whether said compressor is on in a normal operation, when said compressor is not initially on;
- determining whether a **damper** for controlling the amount of cool air discharged into a **refrigerator** is open, when said compressor is on in the normal operation;
- determining whether a control reference temperature for discharge of cool. . . are selected from at least two temperature sensing means arranged to face each other a predetermined distance apart, when said **damper** is open;
- determining whether a control reference temperature for non-discharge of cool air is larger than the absolute value of a. . . is larger than the absolute value of a difference in temperatures sensed by said two temperature sensing means, when said **damper** is open;
- firstly discharging the cool air in a predetermined direction, when said control reference temperature for discharge of cool air. . .

US PAT NO: 5,642,628 [IMAGE AVAILABLE]
 US-CL-CURRENT: 62/186, 408; 165/294

L7: 5 of 6

DETDESC:

DETD(11)

In a still further embodiment of the present invention, single control **damper** 160 comprises a slide 180 (FIG. 3) having an outlet aperture 183 therein and that is movably disposed (such as. . . of air passage 120. Plenum 185 comprises a plurality of output ports 186 which are coupled to respective compartments in **refrigerator** 100 (by way of example, and not limitation, two representative output ports 186 are illustrated in FIG. 3 as underlying slide 180). Drive apparatus 170 comprises **motor** 172 coupled to slide 180 via a drive shaft 178 such that rotation of **motor** 172 causes motion of slide across plenum 185

such that outlet aperture 183 is disposed in a selected position with.

DETDESC:

DETD(12)

Damper drive control system 155 (FIG. 1) further comprises a control unit 190 that is coupled to **damper** drive apparatus 170. Control unit is adapted to provide a **damper** position signal that, when coupled to drive apparatus 170, causes **motor** 172 to drive **damper** 160 to a desired air flow position such that cooling-air flow is directed into a selected outlet port in manifold region 125 of air passage 120. Control unit 190 comprises sensor to determine the cooling demand of respective compartments in **refrigerator** 100. Cooling demand can be determined by temperature measurements, need for defrost, number of door openings of the **refrigerator**, ambient environmental conditions, or the like. As one example, temperature sensor 192 is disposed in first compartment 130 and temperature. . . . comprise a portion of an overall refrigeration system controller as is described in copending application Ser. No. 08/301,731, entitled "Energy Efficient **Refrigerator** Control System", which is assigned to the assignee of the present invention and is incorporated herein by reference

US PAT NO: 3,793,847 [IMAGE AVAILABLE]
US-CL-CURRENT: 62/190, 186, 187, 408, 419

L7: 6 of 6

DETDESC:

DETD(9)

The disclosed **refrigerator** has, in effect, three controls comprising thermostat 35, upper **damper** 43, and lower **damper** 44. Thermostat 35 controls operation of the **motor** compressor to maintain a preferred food compartment temperature of about 37.degree. F., as may be selected by adjusting knob 35b, and lower **damper** 44 is in effect an air-splitting means which proportions the evaporator cooled air between **refrigerator** compartment 12 and freezer compartment 11, in order to afford desired temperature differentials (e.g., about 37.degree. F.) between these compartments.